

**TRADITIONAL AERIAL TRUCK VERSUS A QUINT  
WHERE DO WE GO FROM HERE?**

FIRE SERVICE FINANCIAL MANAGEMENT

BY: Robert John VanSolkema  
Grand Rapids Fire Department  
Grand Rapids, Michigan

An applied research project submitted to the National Fire Academy  
as part of the Executive Fire Officer Program

August 18, 2000

## ABSTRACT

Many fire departments across the country have been fighting scarce local government resources and competition for those resources. Today, every fire chief has the responsibility to take a close look at methods of improving the management of their departmental resources. Fire apparatus is a key area in which improvements can be made. Determining before each apparatus purchase what its objectives are going to be and precisely what outcomes your community requires from it, is a most critical part of managing departmental resources.

The Grand Rapids Fire Department was recently faced with the decision of continuing to replace traditional aerial devices with quints or revert back to the traditional style. The present quints were purchased because of the increasing number of incidents when a ladder truck would arrive on the fire scene without extinguishing capabilities. Department leaders felt a quint provided versatility and options that a traditional aerial device did not.

The purpose of this research paper was to gather available literature and information from the fire service to provide input to assist in the decision.

The study employed action and evaluative research methodology. The following research questions were posed:

1. What is a needs assessment and is it a valuable tool for the purchase process?
2. What are the advantages of quints?
3. What are the disadvantages of quints?
4. Is the current trend for or against the quints?
5. What are important factors when purchasing aerial devices?
6. What is the definition of outcomes and should they be considered for apparatus purchasing?

A review of literature began at the Learning Resource Center at the National Fire Academy in Emmitsburg, Maryland, to gather data for this research project. In addition, a survey instrument was developed and sent to 85 similar fire departments across North America.

The literature review and survey instrument obtained valuable information on the advantages and disadvantages, training, staffing, and standard operating procedures of quints. The literature also produced valuable knowledge on “outcomes” and their importance to the community.

The findings of the research revealed there is not a consensus on the value or use of quints in the fire service today. There was consensus on the advantages and disadvantages of the quints. The research also revealed some inconsistencies on the current trends of purchasing quints.

The recommendations of the applied research project included that a committee be formed and perform a needs assessment for the purchase process. This researcher feels performing a needs assessment and gathering additional information is necessary before the purchase of the two aerial devices.

The goal of the recommendations was to assure a process that would provide “buy in” by the users, fill the needs for the life of the apparatus, and to provide the desired outcomes for the community.

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## INTRODUCTION

Many fire departments across the country are fighting scarce local government resources and competition for those resources. Today, every fire chief has the responsibility to take a close look at methods of improving the management of their departmental resources. Fire apparatus is a key area in which improvements can be made.

In February of 1992, two 100-foot aerial ladder platforms with 1,500 gallon per minute pumps were put into service for the Grand Rapids Fire Department. This meant replacing half the ladder truck fleet with quints. Thus began a new era. Purchasing quints, at a cost of over one-half million dollars each, was an attempt to better manage fire department resources.

The main reason for going to the quint concept was versatility. With the increase in the number of emergency medical alarms, the trucks were beginning to arrive first at more and more fire calls.

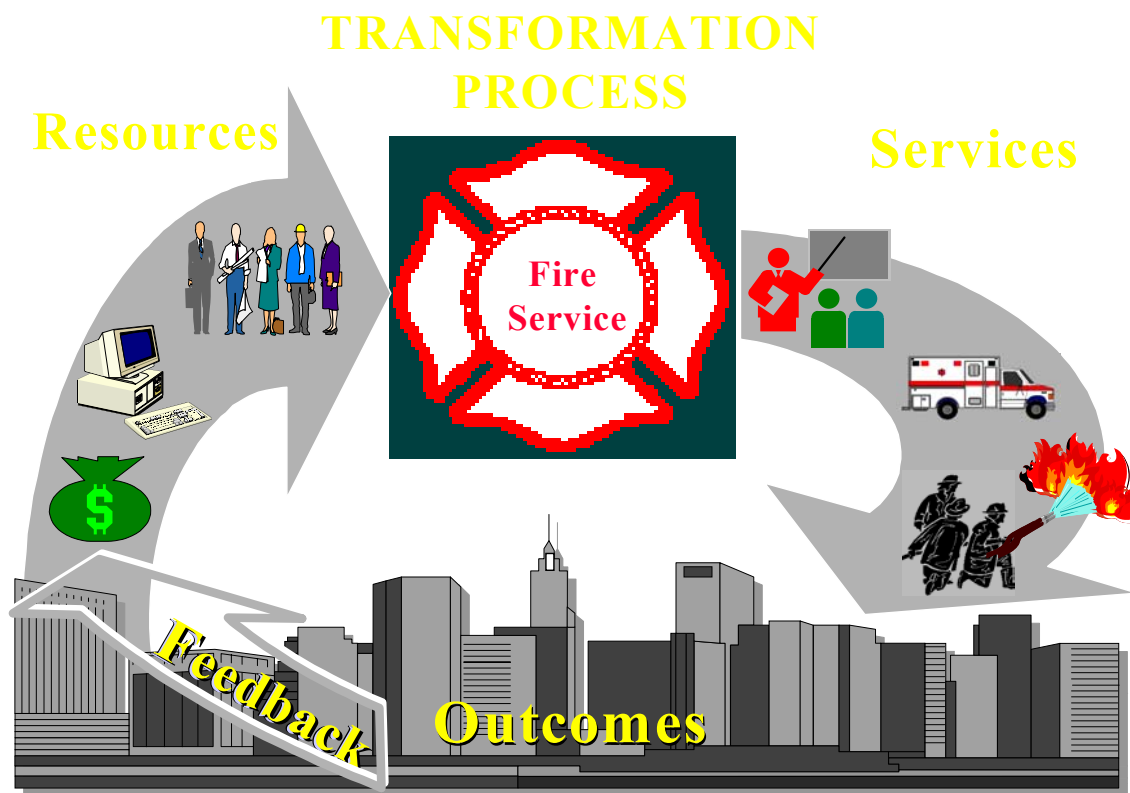
Since the purchase of the quints in 1992, the on-going discussion of their functionality and usefulness has continued. As with many other departments, we have found out that there are both advantages and disadvantages to this type of apparatus. Some firefighters say quints are too big, too slow, too complicated, or too costly. Others think quints are extremely versatile, and in the right application, one of the most effective firefighting weapons around.

The Grand Rapids Fire Department is now ready to replace the two remaining ladder trucks. The problem we face is to continue the quint concept or to revert back to the traditional type of ladder truck. The number of alarms continues to rise, creating the problem of the ladder trucks arriving first, yet the present quints have created controversy since their arrival.

The purpose of this research paper is to gather the available literature and information from the fire service to provide input to assist in the decision.

The “Transformational Process” open system model will also be used as part of the decision process. This model was presented in the “Financial Management” course at the National Fire Academy (see Figure 1). The model concentrates on “outcomes”.

Figure 1. Transformation Process Model (Federal Emergency Management Agency [FEMA] 1996 p. SM 4-14).



Action and evaluative research methodology were used to review the literature and trends of the fire service on ladder trucks to propose recommendations.

The following research questions were posed:

1. What is a needs assessment and is it required for the purchase process?
2. What are the advantages of quints?
3. What are the disadvantages of quints?
4. Is the current trend for or against the quints?

5. What are important factors when purchasing aerial devices?
6. What is the definition of “outcomes” and should they be considered for apparatus purchasing?

## **BACKGROUND AND SIGNIFICANCE**

### **Grand Rapids Fire Department**

The city of Grand Rapids is the second largest city in the State of Michigan. In 1952, the city covered twenty-three square miles and had a resident population of 176,000. In 2000, it has grown to cover forty-eight square miles and the resident population has increased to 194,000.

The Grand Rapids Fire Department operates twelve engines companies, four ladder companies, one rescue squad, one hazardous materials response unit, four pieces of river rescue response equipment, confined space and heavy rescue equipment, and two duty battalion chiefs. The Department has 234 uniformed members.

The apparatus is housed in eleven fire stations. There are six stations that house a single engine, three that house an engine and an aerial ladder, one that houses an engine and a rescue squad, and one that houses two engines and one aerial ladder.

When an alarm is received, if it only requires one piece of apparatus such as a medical, car fire or investigation, then the district engine will respond. If the district engine is not available for response, the ladder truck will respond if it is a medical call, for all other responses, the next closest engine will respond. For a structure fire alarm, the normal response is two engines, one ladder truck, one rescue squad, and a battalion chief.

The Grand Rapids Fire Department currently operates with a minimum daily staffing of 57 firefighters. This allows for three personnel on all engines and four on the ladder trucks. The remaining staffing is five on the rescue squad and two battalion chiefs. On days when the staffing rises above 57, the extra personnel are distributed to engines that will have four personnel for that day.

Starting in 1974, the Grand Rapids Fire Department along with many other departments around the country began diversifying and providing additional services to our community. The reason for making this move was due to the continuing trend of the declining number of fire related incidents. In 1974, the Grand Rapids Fire Department responded to 3,500 fire related incident alarms. In 1999, they responded to 16,567 alarms of which 10,121 were emergency medical responses (Annual report, 1999).

All firefighting personnel are trained to “medical first responder” level response. The engines and ladder trucks are equipped with automatic electronic defibrillators (AEDs) and other equipment necessary for medical alarm response. The district engine is the first assigned to medical emergency alarms. If the district engine is out for reasons such as another alarm or training, then the district truck will respond.

As the number of alarms and training increase for these added services, the result is the engines and trucks spend less time quartered together. The number of fire alarms when the aerial ladder arrives first continues to rise. If the district engine is out and the ladder truck arrives first, there are times when their actions are limited due to no water or hose lines. They would have to wait until an engine arrives with water and hose. While this is only one of the problems created by the increased number of services, it may have serious consequences, especially as the number of alarms continues to rise.



In 1991, fire department leaders decided one way to address the problem was to purchase quint type aerial trucks to replace two traditional aerial trucks. This way if the engine was out for various reasons, there was still a piece of apparatus in the station to handle firefighting.

The quints were placed in low volume locations. One is housed with a single engine and the other is housed with two engines.

The quints did not come without the usual concerns such as function, location, training, staffing, and standard operating procedures.

### **History of Quints**

The most popular firefighting piece of apparatus still seems to be the triple-combination pumper and the traditional ladder truck. In the last few decades, we have had the arrival of many specialty type vehicles.

The need for these specialty type vehicles began to rise in the 1980's, when throughout the country the fire service was forced to respond to the public outcry to cut government waste. It forced the fire service to discover new ways of providing new services in a more efficient manner. They wanted the fire service to do the same with less, or to do more with the same.

With these additional services we carry out, the fire service began combining our vehicles as dual or triple-purpose vehicles.

The combining of functions of apparatus is nothing new to the fire service. Back in the days of horse drawn apparatus, apparatus were made up of three separate pieces. With the invention of the combustion engine, soon the triple-combination pumper was born and eventually the quad and quint came along.

Quints have been in the fire service since the early 1930's. The word quint denotes five. A quint is a piece of fire apparatus that combines a fire pump, water tank, hose, ground ladders,

and an aerial ladder. They did not become popular until the 1970's, when the diesel engine made its way into the fire service. The diesel engine supplied the power needed to provide all the quints functions at the same time (Loeb, 1989a).

Modern quints also carry rescue tools, hazardous materials response equipment, EMS kits, technical rescue tools, and a wide variety of other equipment for engine or truck company operations. They allow a fire department to perform five important functions at any working structure fire (Schaper, Gerner, 1996). These are:

1. Establish an adequate water supply.
2. Attack the fire with sufficient hose lines and master stream devices.
3. Ventilate the building quickly and effectively.
4. Perform primary and secondary searches.
5. Conduct salvage and overhaul operations.

The first quints arrived in the Grand Rapids Fire Department in 1992. They replaced two traditional Ladder Tower Incorporated trucks. If the Grand Rapids Fire Department continues with replacing traditional aerial devices with quints or returns to traditional, it is most important the decision be based on desired "outcomes" as taught in Fire Service Financial Management class at the National Fire Academy.

## **LITERATURE REVIEW**

The literature review will concentrate on the apparatus purchasing process, evaluations that cover advantages and disadvantages of quints, and strategies that are important for the quint concept to be effective. It will also cover the importance of considering “outcomes” and not outputs. The review concludes with research on the separation of the engine and trucks.

### **The Process**

Receiving a new piece of apparatus is always looked at with a great deal of anticipation. Unfortunately, that happy anticipation is often tempered with disappointment in the actual design and appearance of the delivered apparatus.

An important, but often forgotten step in purchasing a new piece of apparatus is conducting a needs assessment to identify what type of apparatus the department is interested in purchasing. What does your community need the apparatus for and what “outcomes” do they expect from it? This should be done before talking to salespersons and other manufacturing representatives (Steffens, 1990).

A needs assessment is an analytical and objective identification of required changes in the organization. A needs assessment utilizes objective data and proven analytical techniques to document the existence of an organization’s operational or service delivery deficiencies. It identifies “true needs” instead of “wants”. This helps members to focus on the needs of the community. It ensures that information necessary is gathered and analyzed in an appropriate manner. In addition, the structured approach results in the accumulation and analysis of data in a manner enabling the department to demonstrate the reasons for its conclusions and to defend its decisions.

The following is a list of steps in conducting a needs assessment.

1. *Define the focus of the assessment.* This sets the parameters of the study.
2. *Collect the data.* Gather all existing data and information on the subject of the study. This includes biased as well as objective data and individual opinion as well as documented fact.
3. *Generate data.* If data or information is not available, it may be necessary to collect primary data through research techniques
4. *Organize the data.* The data must be organized in logical groupings and format so that it can be constructively utilized.
5. *Analyze the information-compare and contrast data.* It is important to analyze the information appropriately.
6. *Interpret data.* Once data has been analyzed, the results must be translated into a form useful to the organization.
7. *Determine needs.* Once the data has been interpreted and the problems identified, it is necessary to plan what needs to be done.
8. *Set priorities.* The final step in the needs assessment is to assign a priority of needs on the basis of which are most critical to the provision of quality service (outcomes) (Grant, Hoover, 1994).

The concept is basically to help design a piece of fire apparatus to perform its assigned duties in a systematic fashion and to acquire a piece of apparatus that will fit the needs of the community you serve. You will be the proud owner of this apparatus for up to twenty years.

When committing to purchasing a new vehicle, the leaders of the department must clarify its functional intent. Basically, determine the types of jobs the vehicle must carry out. Questions

such as how big, type of ladder, how long of a ladder, types of tools, whether to carry out the functions of two vehicles, or one combined unit, need to be answered.

Part of tactical design includes involving during the design phase, the personnel who will use the vehicle. When purchasing a new vehicle, you should spend some time brainstorming with department members who will utilize the vehicle. Some questions to ask should include what they like about existing vehicles, what they don't like about existing vehicles, and what they would like a new vehicle to do differently or additionally.

Getting "buy-in" of the membership early provides several advantages: first, personnel are likely to fully utilize a vehicle they feel they had a part in designing; second, the truck will be more user friendly (Jakubowski, 1993). Keep in mind the members will generally have more focus on how the truck functions for their use, not the outcomes provided to the community.

### **The Advantages and Disadvantages**

One of the first publicized evaluations of quints was back in 1989, when Fire Chief Donald L. Loeb, conducted a national survey on the use of quints. The evaluation consisted of three articles spanning three months in *Fire Chief* magazine.

The survey was sent to over 100 fire departments across the nation operating quints at the time. Of the 100, only about 50% were returned. Some were not filled out but returned. The survey asked some short, but basic questions such as, size of department, description of their quint, and what advantages did the quint give to operations (Loeb, 1989a).

The survey also asked questions of equipment, hose, ladders, and compartment space. It additionally asked, "What advantage has your quint given your operation?" One answer from Gadsden, Alabama said, "It permits efficient utilization of manpower by combining operations

into one multi-purpose response company.” Over and over the term (or its equivalent) was multi-purpose.

When using the quint to get additional credit for its multi-purpose use, do not look for credit for both engine and truck companies. Although components do exist, the unit cannot realistically be in several places at one time. Generally, a quint will not be staffed to meet the demands of both.

The general impression from the survey from the departments using quint was strongly favorable. Although one major West Coast City, which had more than one quint, wrote, “The quints purchased by this department were never really placed in service and have recently been sold. After extensive testing, the quints were found not to be suitable to our type of firefighting.” At the time, they fought over 6,000 fires each year. There were other departments that also had negative comments. One department reported the advantages were few and that the quints had caused enough operational problems for them to replace them with traditional aerial ladder trucks.

The operational aspect was also addressed in the survey. It tried to uncover whether or not the quints normally worked at fires using both engine and ladder company modes. Some said yes while others said it was left up to the company officer based on each incident. One department reported the quint was widely used during full-alarm assignments and provided sufficient equipment, enabling companies to work specifically as engine or truck. But the option to convert the quint into dual operation was available, so the equipment can be used to the optimal advantage.

Two favorable quint advantages were seen over and over in the survey returns. First, it is able to pump its own requirement during ladder pipe operations without calling for or relying on another pumper.

The second biggest advantage was the ability of the unit, which is generally regarded as a ladder truck, to convert and replace a pumper. One striking comment was “If we’re the first at a fire, we can start applying water. While we’re out driving around and come to a car fire, we can put it out.” Another similar comment: “If first at a structure fire and the situation lends itself to a quick knock down, the quint affords us that capability (Loeb,1989b).”

The St. Louis Fire Department has illustrated some of these capabilities and more (see Table 1). Since 1987, the St. Louis Fire Department has been successfully using the “total quint concept” to fight fires. They went to the concept due to major budget cuts that made its traditional engine/truck systems incapable of delivering adequate fire and rescue services to their community (Schaper, Gerner, 1996).

Table 1

Traditional System Vs. Total Quint-Concept A comparison of the capabilities of the engine/ladder system in 1986 and the Total Quint Concept in 1995			
	1986	1995	
Pumping capacity	37,500 gpm	65,000 gpm	+ 73%
Number of aerial ladders	10	34	+ 240%
First-alarm staffing	14-17	28	+64%
Aerials on first alarm	1	5	+400%
Companies capable of engine work	30	34	+13%
Companies capable of truck work	12	36	+200%

Companies capable of rescue squad operations	10	36	+260%
Companies capable of EMS operations	0	36	Total
Extrication tools	10	38	+280%
Ventilation fans	14	42	+200%
Rescue saws	12	38	+216%
Firefighters on department	752	631	-16%
Source: St. Louis Quint Concepts, L.L.C.			

The above table shows the benefits of going to a “total quint concept”. While not very many departments have gone to this concept, it shows some of the advantages mentioned in the evaluation.

In order to gather some negative or disadvantages of quints the survey asked, “What problems have you entailed”? The majority responded to the question with a simple “none”. One chief wrote. “If you have strict SOPs, you should not have any problems”.

Another said he had problems arise, “Periodically, keeping the operations of truck company and engine company separate enough to be effective”.

One response from the survey said “None that we haven’t been able to overcome through training and education.” (Loeb, 1989b)

Yet others refer to a quint only as something the chief of the department thought was necessary. A quint is a multi operational company that is most often staffed to perform one operation at a time. A concept that results in an apparatus that is expensive, large, and not easily maneuverable in many areas.



The quint will typically have a 240-inch wheelbase and gross vehicle weight of 48,000 to 66,000 pounds. Although the quint may have more flexibility, if it has a long aerial device, the result is a piece of apparatus that is often “too big, too heavy, and too high” (Loeb, 1992, p.63).

The quint does not offer maneuverability as one of its strong points. (Common turning radius is 44 feet). New standards for cul-de-sacs require them to be 60 feet wide. However, that does not make up for the thousands of cul-de-sacs that already exist that are considerably smaller and won't accept a 44-foot turning radius (Mittendorf, 1996).

Strock (1994) found the following practical considerations from departments that were utilizing quints: water tanks were often too small for required operations; apparatus breakdown created a major fire protection breakdown; vehicles were often too large, too heavy and too high; design deficiencies often made repacking or reloading of attack and supply line difficult; and it was difficult to keep engine and ladder company operations separate by quint crews.

## **Strategies**

### **Training**

The single most important factor for a quint to be effective is training. As the late Vince Lombardi once said, “The will to win is nothing, without the will to prepare”. In the fire service, saving lives and property is the same as “winning” (Hatch, 1996).

An improperly trained crew or poor leadership will cripple or limit a quint. In fact, the lack of training of both the officer and crew is the cornerstone of the effectiveness or ineffectiveness of a quint.

Two considerations associated with officer training are experience and specialization.

### **Officer Experience**

The last place to assign a new or inexperienced fireground officer is to a quint. For a quint to be effective, it demands an officer who is able to size up the many and varied needs,

prioritize those needs and then meet them with limited personnel (remember staffing is usually at three or four). This takes fireground experience and both engine and truck company operations experience.

### Specialization

The other consideration of training is specialization. It is most important that the officer in charge of a quint equally train the crew in engine and truck company operations. One advantage of separate functional companies such as engine and truck, is that these companies tend to specialize in their responsibility. When responsibilities are combined, being cross-trained is essential for the company to be effective. Cross training also means that later-arriving crews are capable of using the quint for another operation (Mittendorf, 1996).

If members are not cross-trained, it can cause confusion on the fire ground. If engine work is required, then your ladder truck company is lost. If both engine and truck work is preformed, it is not performed effectively. Most of the time, firefighters have either a truck/ladder mindset, or a pumper/engine one. In other words, they are either water or tool oriented. This comes from tradition.

Training is most essential, because both mindsets must act as one in order to operate a quint that has both engine and truck capabilities. Training also teaches when to use the quint as an engine or as a truck should lack of manpower prevent both operations being preformed at once. Training and drilling can also address the tradition issue (Hatch, 1996).

### Location

Despite its versatility, if a quint is housed in the wrong location, all of its capabilities and advantages may not be used to the fullest. The best locations for a quint are at stations that make

less than 2,000 runs a year, an outlying station or one serving a large population of apartment complexes or a big industrial area (Hatch, 1996).

With the thought of private dwellings becoming too expensive for most people to obtain, a larger, but not less combustible, multi-dwelling condominium has taken its place. While a pumper or two could handle the one-story detached frame dwelling, the condominium requires a good deal more. The quint then may be a better solution (Loeb, 1989b).

### **Staffing**

The best way to get one piece of apparatus to operate as both an engine and a truck at one time is to staff it with eight well-trained firefighters. Realistically, few departments can or will staff a single piece of apparatus with that many personnel.

Generally, when staffing is at three or four personnel, the quint will either operate as an engine or a truck but not both at once. If the luxury of five or six personnel is available, some simultaneous operations can be performed, but will take careful coordination of personnel (Hatch, 1996).

In a scenario where a quint is staffed with four personnel and is first in to a fire in a single-family dwelling, the officer is occupied with command functions. The equipment operator assists with hose deployment and running the pumps; the two firefighters advance the attack line. Basically, the entire company has been utilized to advance a single attack line. The initial flexibility is lost. Search and rescue, ventilation, utilities, and other operations will have to be handled by later-arriving companies (Mittendorf, 1996).

To attempt to maintain or regain the flexibility, neighboring fire stations may provide a means of personnel for a quint. The personnel need to be properly trained in its use. This concept is useful in industrial areas or apartments where access is limited (Hatch, 1996).

The research process revealed that staffing for departments that use quints varied. Consensus was that as the level of staffing rose, so did the level of efficiency and effectiveness of the quint.

### **Standard Operating Procedures**

Along with training, location, and staffing strategies, standard operating procedures must be developed for quint operations. Depending on its arrival, first, second, or third, on scene, there must be a procedure for designating the quint as a truck or an engine.

If the quint is first due, it may be necessary to send another aerial in its place, as it may operate in an engine capacity attacking the fire. If the quint is second or third due, it most likely will operate as a truck company (Hatch, 1996).

Standard operating procedures for quints and their operations vary among jurisdictions. In some departments, the operation of the quint is left up to the company officer as he or she arrives on the scene. Other departments will use quints as engine companies or truck companies. Some other locations use the quint for a ladder company only, and require that the pump will only be used for tower master stream operations. Generally, most departments dispatched a quint as a truck company, but would assign it engine company duties if a situation required a switch (Loeb, 1989c).

### **Outcomes**

Creating a model of the fire department system helps everyone have a better understanding of the whole and of the component parts (see model page 6). Constructing a model of the fire department begins with defining its boundaries within which the fire department operates. The first component is the political arena and the politics every fire department must balance.

The second component involves identification of the resources the department required to produce its programs and services. These resources are needed to provide resources for programs such as training, inspection, and investigation to name a few.

The third component of the open systems model is identifying what the department processes are. This component answers the question of what the department does with its resources. Every department plans, staffs, trains, develops, and purchases.

The fourth component of the system identifies the departments programs and services. It is an inventory of the programs and services the community is funding.

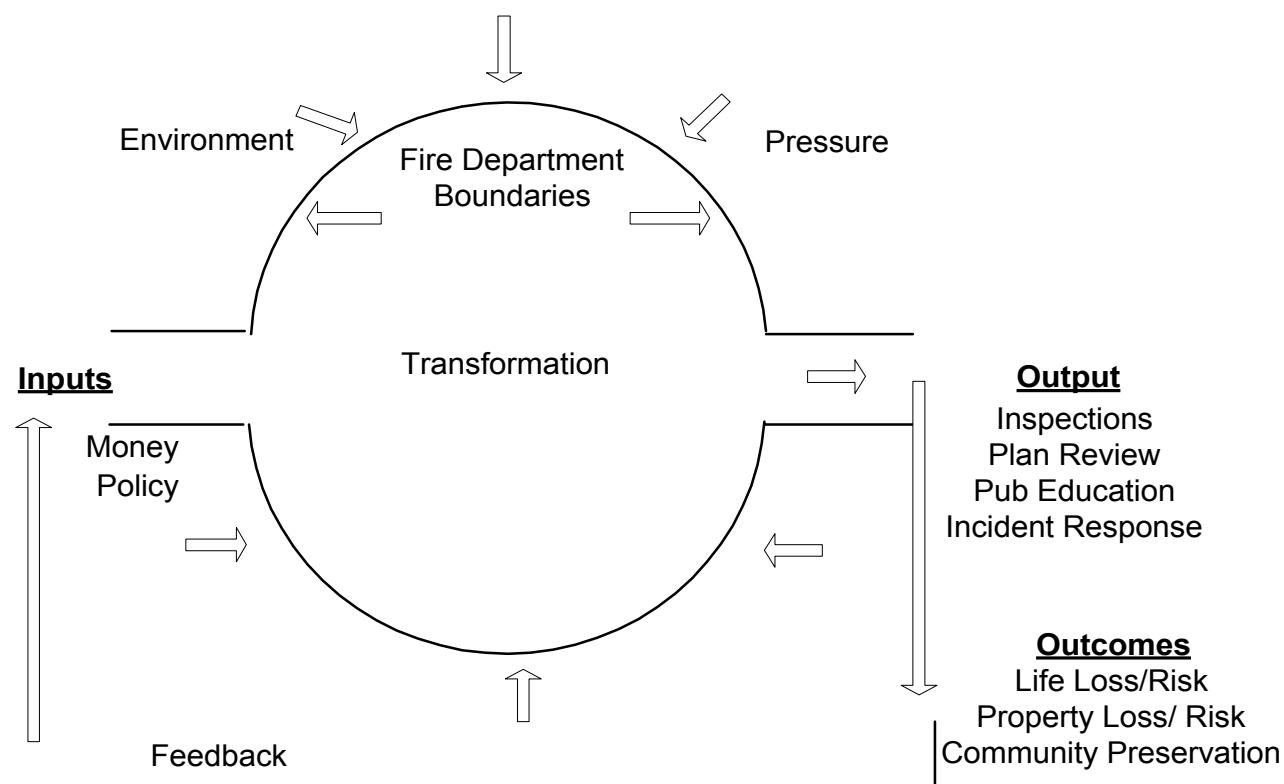
While the model may look complete, an important element is missing. To be successful, the department anticipates making a difference to the community it serves. In order for the model to be complete, the department needs to identify outcomes.

In the book *Urban Outcomes*, the definition of outcomes is defined as “the end of a complicated process”. Outcomes are the consequences of the services provided. *Urban Outcomes* notes, that the citizens may have opinions about how resources should be allocated, what apparatus should be bought or its location. However, they do not have the knowledge to make decisions on allocation or apparatus. In the book *The Power of Predictability*, the authors discuss the need to help the organizations predict the outcomes of its actions. We as fire service leaders must make these decisions with the community as the focus. “The leaders of today’s organizations must start with a honest assessment of the organization’s situation, the possible outcomes of any action the organization may take, and what each outcome will mean” (FEMA, 1996).

The model (Figure 2) demonstrates another system model that helps illustrate the fire department and community. The model is an open system that receives input (money, policy,

processes, and other resources), transforms the raw materials, and outputs to the environment finished products and services. This system also has impact, through its outputs, on the community. These impacts again are called outcomes, the effect of the department's outputs interacting with the community.

Figure 2



Source: (Financial Management, Fire Chief's Handbook, 1995)

Financial management is the art or skill of directing the acquisition and judicious use of money to accomplish an end. The end in question should be outcomes, not the outputs. Resource decisions such as apparatus should be made with the objective of affecting the community life, property, and environmental safety, or other community based outcomes, rather than incident response (Wren, 1995).

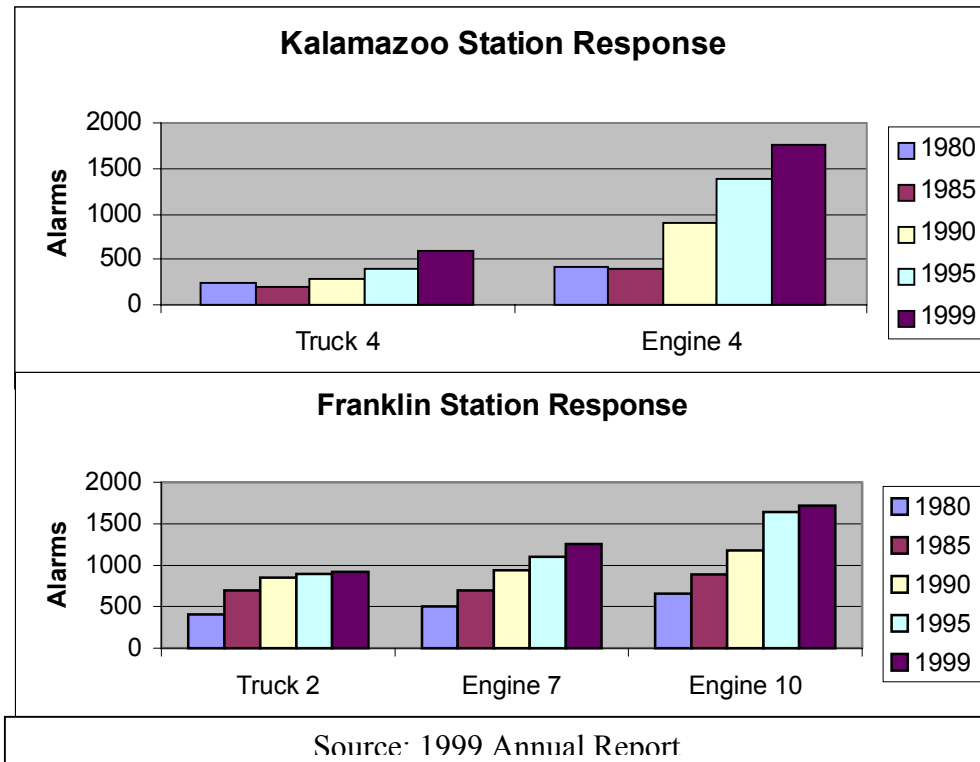
The focusing on outcomes and not outputs is most important when purchasing any type of apparatus. We must start with an honest assessment of the situation, the possible outcomes, and what each outcome will mean.

### **The Separation**

All four Grand Rapids Fire Department ladder trucks are housed with at least one engine company. When a truck and an engine are both in quarters, responding in tandem allows them to carry out necessary firefighting activities. If an engine is out, the truck can be the first on the scene.

The number of alarms continues to increase citywide every year. In 1980, the Grand Rapids Fire Department responded to 6,266 calls. In 1999, the number of calls has risen to 16,251. This represents an increase of over 250 % (Annual report, 1999).

The number of incidents when the truck arrives first also continues to rise (see Figure 3). Listed for example are two stations and the number of alarms for both the truck and the engine(s) that it is housed with.

**Figure 3**



The separation of the trucks from the engines is not only caused from emergency response incidents. Training is another major cause of separation. Literature was not available to present data on the actual increase of mandated and department required training. However, few departments may dispute the increase.

Other causes of separation of the trucks from the engines such as hydrant maintenance, building inspections, and other daily job requirements are also on the rise. These along with emergency response are and will continue to increase. Fire service managers must make important decisions and predictions based on these trends.

## **PROCEDURES**

The research was conducted following the Fire Service Financial Management course at the National Fire Academy.

The research procedures used in preparing this paper began with a literature review at the Learning Resource Center (LRC) at the National Emergency Training Center (NETC) in March of 2000. Additional reviews were conducted at the Grand Rapids (MI) and Grand Haven (MI) public libraries in Grand Rapids and Grand Haven.

The literature focused in five areas. The first focused on purchasing apparatus, and why a needs assessment is important. The next area was about evaluating the advantages and disadvantages of quints. Another area covered some of the strategies that make quints work. The last area was on the model from the Financial Management course covering “outcomes”.

A survey instrument was then developed. The survey instrument called “Applied Research Project Survey” (Appendix A) was sent to 85 fire departments across North America

that were similar in size (200 or more members) and provided similar services to their community. The information was then entered into an Excel spreadsheet. The purpose of the survey was to gather and compile information and data from other departments relating to the purchasing and use of quints.

The survey consisted of 10 questions. The purpose of questions one through three was to gather information about their department to ensure comparison. Questions four through eight gathered information on ladder truck purchasing practices. Questions nine and ten gathered information on important considerations when purchasing ladder trucks. There was also a request for additional research information by providing the survey responders an opportunity to give their comments on quints.

The Transformation Model from the Fire Service Financial Management course covered how resources or inputs such as people, time, and money are invested into the fire service to be transformed into services. The services are then transformed into outputs or “outcomes”.

The model was used to maintain focus on the needs or outcomes for the community and not just the functional or operating features of ladder trucks for the fire service.

The literature was obtained from the Grand Rapids Fire Department Dispatch Center as well as from the Learning Resource Center at the National Fire Academy in Emmitsburg, Maryland. Literature on ladder trucks and purchasing was examined from the public libraries in Grand Rapids (MI) and Grand Haven (MI). The books and publications were most helpful, relevant, and much information was gathered.

### **Assumptions and Limitations**

As with all surveys, it was assumed all respondents would answer the survey honestly and were in a position within their organization to have the appropriate knowledge for answering

each question. This assumption appears to have been flawed. Some of the surveys were returned with only the front questions answered. In addition, some surveys were returned with questions left blank. The survey instrument was sent out to 85 departments, and only 68 of 85 (80 %) returned.

The survey was non-random. The population sampled was not representative of the fire service in the United States. It was sent to professional fire departments from metropolitan cities and counties. However, it was important to use departments similar in size and that they performed like services for their community.

## **RESULTS**

The results of the research paper are accumulative in nature and represents a comprehensive study of all the material gathered. The author attempted to answer all six research questions as accurately and thoroughly as possible to accomplish the objective of the paper.

The first research question asked, “What is a needs assessment and is it a valuable tool for the purchase process? This was one important question that was not covered in the survey instrument. However, it should be noted that under the “comments” portion of the survey, 29 (43 %) responders took the time to write how important a needs assessment was to the purchasing process without the question being directly contained in the survey.

The literature and survey supported the importance of a needs assessment or other like tool in assisting fire service leaders in making the best decisions. Needs assessments assist fire department administrators in defining problems more accurately, identify the causes of problems, and examining relative merits of alternative solutions (Grant, Hoover, 1994).

The second research question asked, “What are the advantages of quints”?

The advantages of quints revealed by this research include:

1. Quints functionality:

- Establish a water supply.
- Attack the fire with sufficient hose lines and master stream capability.
- Ability to carry out ventilation procedures.
- Equipment to perform search and rescue operations.
- Conduct salvage and overhaul operations.

2. Quints versatility.

- If arrive first at fire scene, can begin firefighting operations.
- Carry equipment found on both engine and aerial trucks.
- Can be used as either engine or truck or both if staffed adequately.
- Self-supporting. (no need for engine to supply water).
- Improved aerial coverage (i.e. St Louis).
- Can handle minor fires without an engine. (car fires, trash fires, etc.).
- Work well in apartment and condominium environments when access is limited.
- Require additional training and standard operating procedures.

The third research question asked, “What are the disadvantages of quints”?

The disadvantages of quints revealed by this research include:

1. Quint functionality.

- Reduces compartment space and ground ladder capabilities.
- Add additional weight to a piece of apparatus that is already too heavy.
- Poor maneuverability, require large area to make turns.

- Increased maintenance costs.

## 2. Quint Versatility.

- Causes operational confusion on the fireground between engine and truck work.
- Requires additional training, strategies, and standard operating procedures.
- Sufficient manpower is required to accomplish its mission.
- Causes labor unrest (quints are used for staffing reductions).

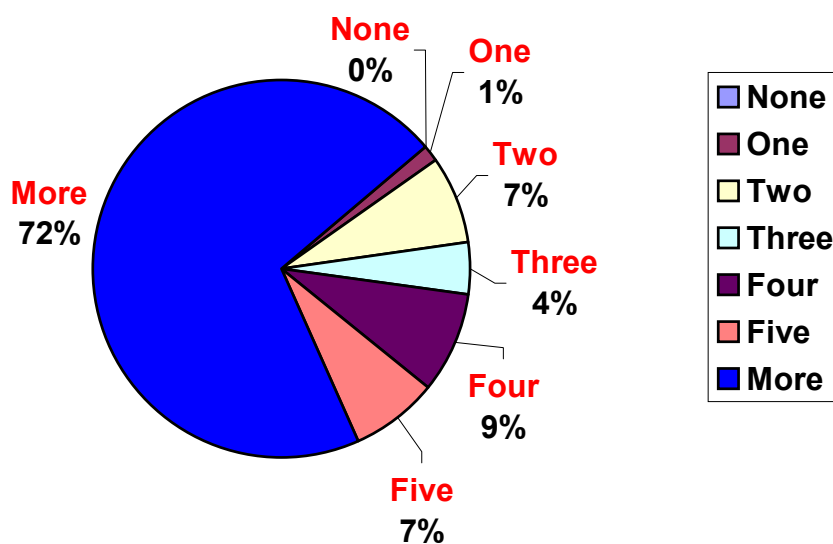
The research did reveal many advantages and disadvantages for quints. In 1989, Loeb revealed that one main advantage of the quint is it's a multi-purpose unit. The quint provides different options depending on the situation. These options don't come without costs. The costs include ensuring crews are properly trained and have solid standard operating procedures.

The fourth research question asked, "Is the current trend for or against the quints"? The survey first attempted to find out how many aerial trucks each department had in service (see Figure 5). The breakdown was that 48 out of 68 (72 %) had six or more, in their fleet. Of those who responded to the survey, the department with the most aerial devices had 27, only three were quints.

When Loeb (1989) conducted his survey, it went out to over 100 fire departments that were using quints at that time. The response for the survey was less than 50 %. This authors survey was sent out to 85 departments with a response of 80 %. The survey was also designed to find out if larger departments are moving toward or away from the quint concept.

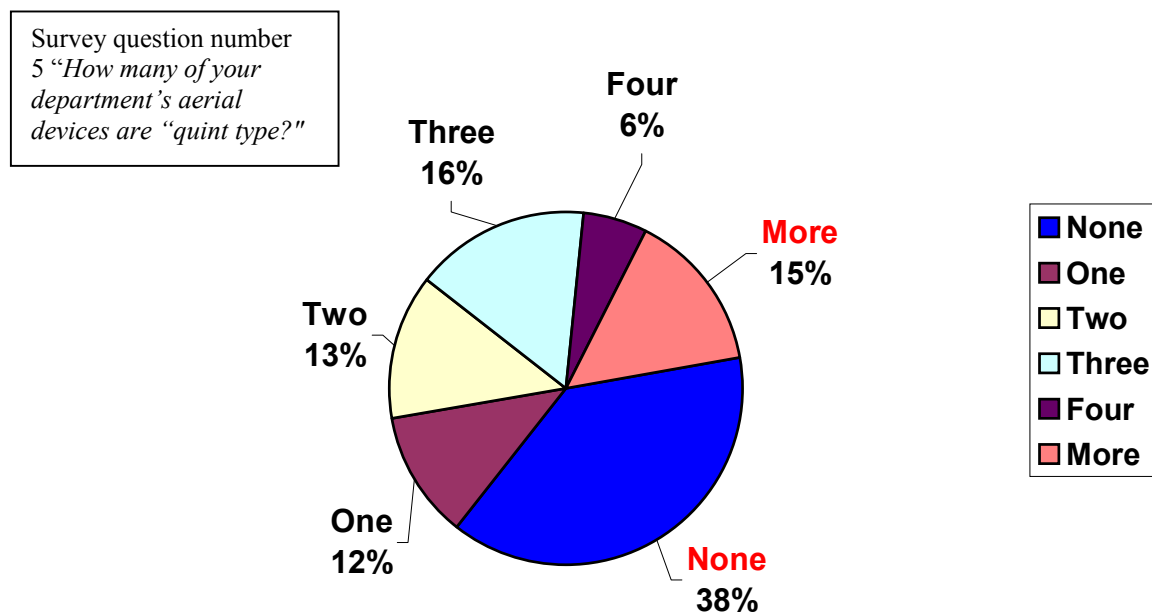
Figure 5

Survey question number 4  
*“How many aerial devices  
 presently exist in your  
 department?”*



With 72 % of larger fire departments having six or more trucks in their fleet, it was necessary to research how many were using quints. Research question number five revealed that 26 of the 68 (38 %) that responded do not have any quints in service (see Figure 6). Of the 10 (15 %) who responded to “more” on the survey, the highest number on quints was 20 and the lowest was six.

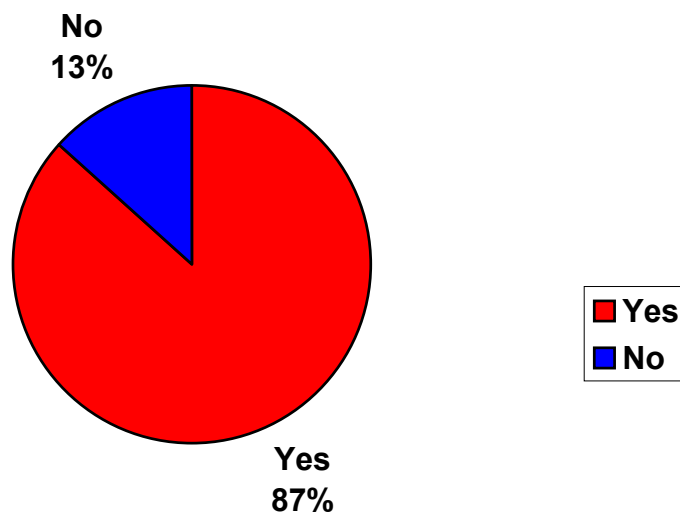
Figure 6



Survey question number six asked, "has your department purchased any new aerial devices in the last five years?" Of the 68 who responded 59 (87 %) departments have added new aerial devices to their fleet (see Figure 7).

Survey question number 6 “*Has your department purchased any new aerial devices in the last 5 years?*”

Figure 7



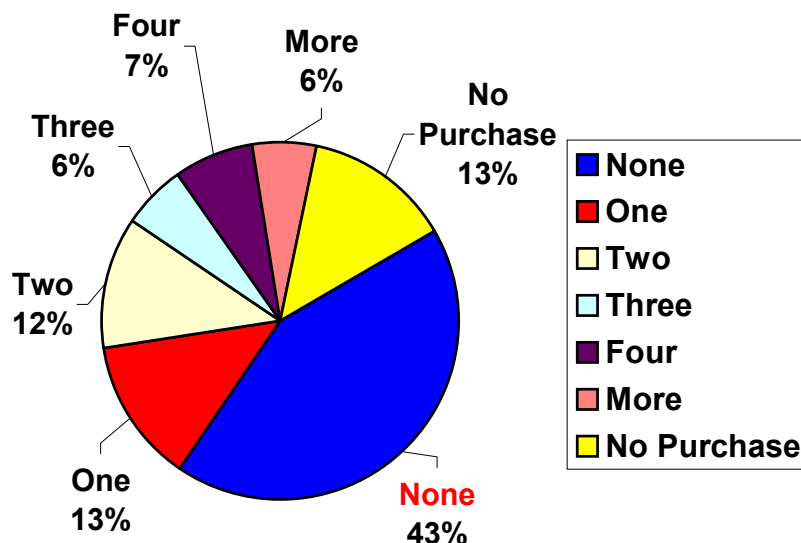
In 1996, Mittendorf wrote that the quint concept has progressed to a point where it is considered popular in the United States. As an example, comparing sales of aerial devices, one leading manufacturer sells 90 percent quints and only 10 percent traditional aerial trucks.

With 87 % of responding departments purchasing new aerial devices in the last five years, what are they buying? Survey question number seven revealed that 29 (43 %) of the departments that purchased aerial devices did not purchase quints while 30 (44%) bought at least one (see Figure 8). The remaining nine department's (13 %) had not purchased any aerial devices in the last five years.



Figure 8

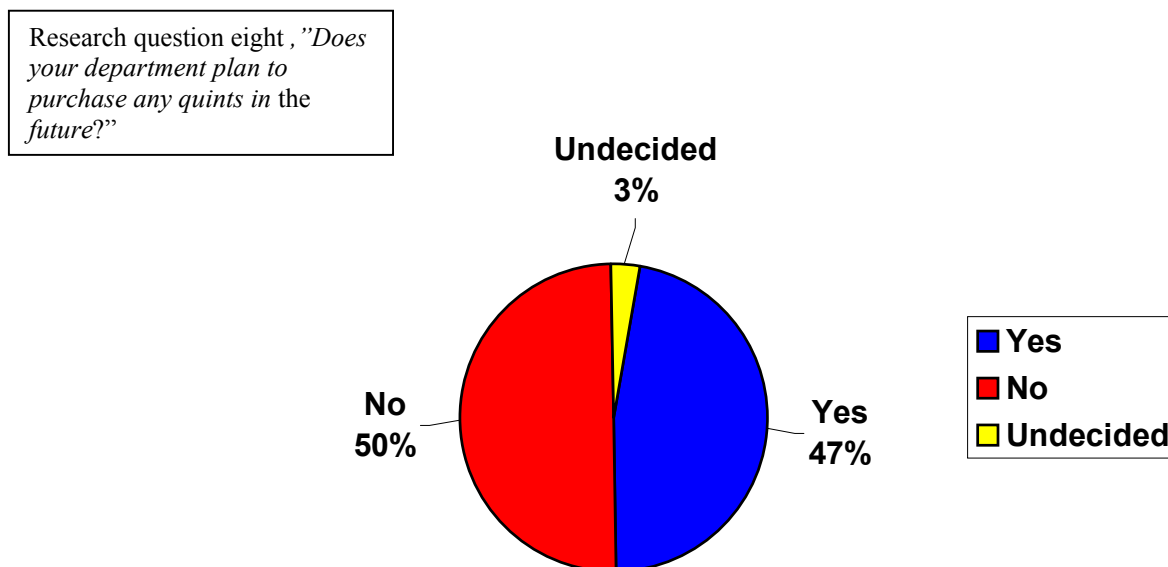
Research question seven *“How many quints has your department purchased in the last five years?”*



The next survey question obtained information on department's future plans of purchasing quints. Loeb (1989) felt he had sought and won agreement from both producers and consumers that they were in a quint era. He went further to say that if you eyed fire apparatus deliveries or fire department equipment rosters, you would have concluded that back then was a time of “Quint Fever” (Loeb, 1989a).

The survey revealed that 34 (50 %) of the responding departments had no future plans to purchase quints while 32 (47 %) responded yes to purchase quints in the future (see Figure 9).

Figure 9



Research question five asked, "What are important factors when purchasing aerial devices?"

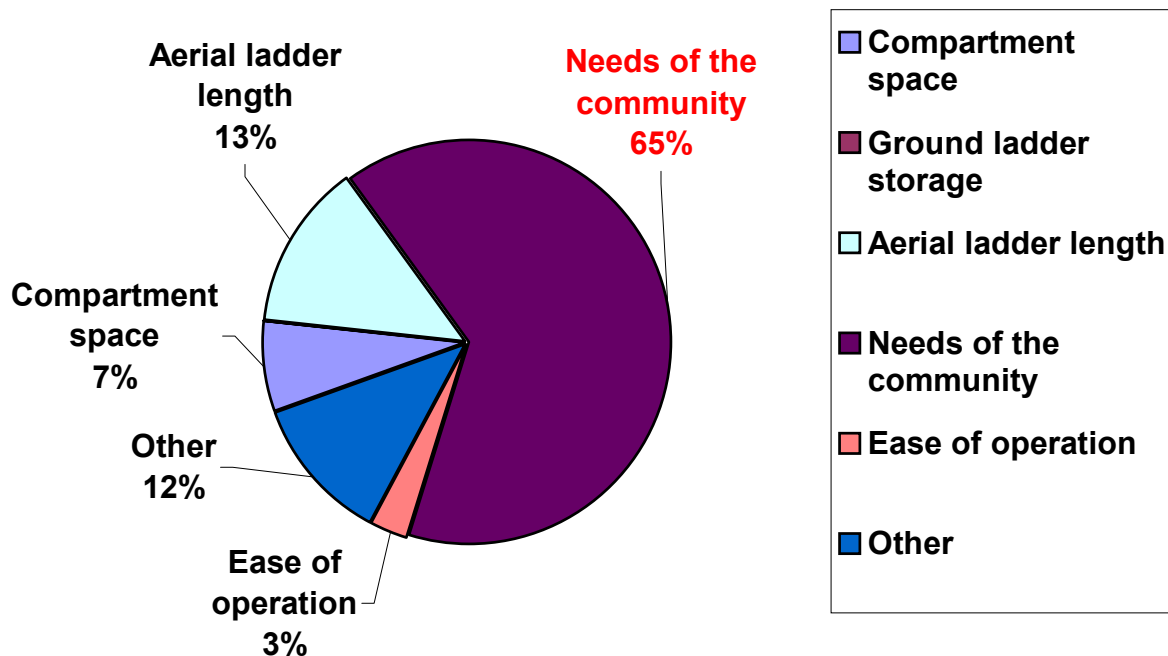
Question nine of the survey researched factors to consider when purchasing an aerial device (see Figure 10). The question covered both operational and functional factors. The operational factors included compartment space, ground ladder storage, and ease of operating the device. The functional factors included aerial ladder length and fire pump. There was also a space provided for the responder to add other considerations they felt strongly about.

Although it was listed as a disadvantage of the quint, ground ladder storage along with fire pump were not chosen by all 68 responders as the most important.

The most important consideration from those responding was needs of the community. It received 44 (65 %) out of the 68. There were other considerations returned that were not on the survey which included reliability, maneuverability, turning radius, costs, and safety.

Research question nine  
 “When writing  
 specifications for an aerial  
 device, what is the most  
 important?”

Figure 10



Research question number 6 asked, “What are “outcomes” and should they be considered”?

In the literature review the definition of outcomes is defined as “the end of a complicated process” in the book *Urban Outcomes*. “Outcomes are the consequences of the services provided” (FEMA, 1996).

The needs of the community was contained in survey question eight.

*Urban Outcomes* notes, that the citizens may have opinions about how resources should be allocated, what apparatus should be bought or its location. However, they do not have the knowledge to make decisions on allocation or apparatus. In the book *The Power of Predictability*, the authors discuss the need to help the organizations predict the outcomes of its

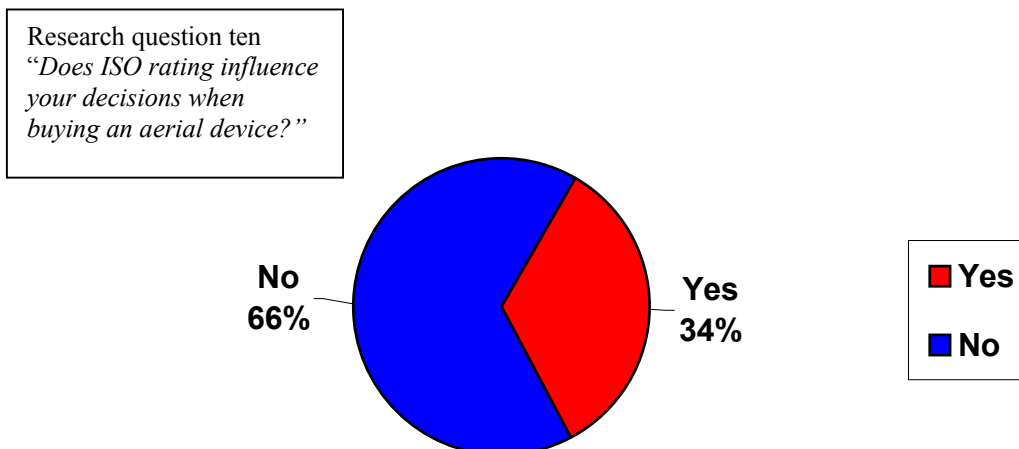
actions. We as fire service leaders must make these decisions with the community as the focus. “The leaders of today’s organizations must start with a honest assessment of the organization’s situation, the possible outcomes of any action the organization may take, and what each outcome will mean” (FEMA, 1996).

The last survey question asked, “Does ISO (Insurance Services Office) rating influence your decision when buying an aerial device? This question was part of the survey because of its association with “outcomes”. The types of apparatus affect the City’s rating and insurance costs for the citizens.

The literature review revealed that when quints are looked at for fire insurance ratings, it was hard getting a consistent answer. Departments cannot expect credit for both engine and truck companies. Although components for dual functions exist, the apparatus cannot be in several places at one time. If the quint can fill both responsibilities together where it sits, and is staffed to do so, credit will be given to a complete unit for one function, even though it might constitute a fraction of a unit (Loeb, 1989b).

Only 23 (34 %) of the 68 responders considered ISO rating when purchasing an aerial device and the remaining 45 (66 %) did not consider ISO rating (see Figure 11).

Figure 11



When ISO does an audit on a fire department, they take a look at its apparatus, how it is designed and equipped. An unsuspecting fire chief can look bad for buying apparatus that will negatively affect the community's fire insurance for the next 15 years. How do you explain away a \$750,000 aerial device that did not count as one-and-a-half fire truck? Especially, if that is why the piece of apparatus was approved.

It doesn't really matter if the fire service likes ISO. You will be graded against it any way. Ignore the ISO list, and your citizens and businesses will pay the price for your decisions (outcomes) in the form of higher insurance rates (Stevens, 2000).

## DISCUSSION

The results of this research compared positively with the findings of the authors reviewed in the literature review process. The study also proved how valuable needs assessments are in the purchasing process. It is very important for a department to know how each piece of apparatus will fit in your community before it arrives. Knowing the expectations of the apparatus before purchasing will assist in knowing the outcomes expected from the apparatus.

The literature and survey instrument did show consensus on the advantages and disadvantages of the quint. The study showed two major advantages. The first was the quint's versatility to be able to pump its own requirements during ladder pipe operations without calling for or relying on another pumper. The second was the ability of the quint, which is first considered a ladder truck, to convert and replace a pumper.

The disadvantages were also clearly outlined by the literature and the survey instrument. They included poor maneuverability, too large, difficult to keep engine and truck company operations separate, limited credit by ISO, and maintenance issues.

Comments from the survey instrument included, "no advantages to a quint without staffing", "When duties are combined, it loses in one way or another", and "Past experience with dual purpose apparatus provided conflicting operation procedures. The benefit of pumps and water do not outweigh lost space for equipment needed for truck work".

The literature covered ways to overcome many of the disadvantages by training, officer experience, location, staffing, and solid standard operating procedures.

The literature also told of *The Power of Predictability*, and how the authors discuss the need to help the organizations predict the outcomes of its actions. We as fire service leaders must make these decisions with the community as the focus. "The leaders of today's organizations

must start with a honest assessment of the organization's situation, the possible outcomes of any action the organization may take, and what each outcome will mean" (FEMA, 1996).

An example of predicting outcomes was demonstrated in this author's most recent class at the National Fire Academy in Emmitsburg, Maryland. During this class the use of quints was a common topic. A large department utilized quints but the pumps were considered a low priority for repairs. In a relatively short period of time, the department experienced several fire deaths. They ranged from an elderly gentleman to two young children. In each incident the ladder truck was the first arriving piece of apparatus. The engines were on other calls, or out of their district. This resulted in lengthy delays and the ladder truck being first on the scene without the use of their pump, water, and hoses due to needed repairs. The outcomes were five fatalities.

The citizens of this community became outraged. The surviving family members began litigation for the apparatus not functioning properly when the department was fully aware of the needed repairs.

In an effort to remedy future problems of this type, the department replaced the quints with new traditional ladder trucks. Recently the same scenario occurred with the new ladder truck arriving first. The department is being sued for damages occurred for not having the pump, water, and hoses needed to attack the fire.

If you apply this example to the Transformation Model (see pg 6), it illustrates that the outcomes (five fatalities) of not having the pumps in working condition would be the same (five fatalities) even with the purchase of new traditional ladder trucks. The only difference is the new trucks shine more.

While the literature and the survey instrument did support one another, there also were some unexpected findings. In 1989, the fire service appeared to have quint fever. The survey

instrument revealed that 87 % of responders had purchased aerial devices within the last five years. It also revealed that 38 % of the departments that responded do not have any quints and that 50 % do not have plans to purchase any. According to the results of the survey, the fire service no longer has quint fever.

There were also inconsistencies in the literature and survey. The literature revealed how a needs assessment was most important. It discussed how a needs assessment will assist organizations in distinguishing the differences between “wants” and “needs” (Jakubowski, 1993). The results of survey question eight revealed 66 % departments that responded felt the needs of the community was the most important consideration when purchasing an aerial device. Yet the advantages and disadvantages revealed in the literature and the survey centered on the operation and function of an aerial device, or “wants” and “needs” of the fire service, not the outcomes to the community. Only one responder commented on how important it was for fire departments to provide its firefighters the capabilities and option to perform the tasks needed to obtain the best outcomes for the community.

The research for this project has clearly demonstrated how controversial the quint concept is. The numbers clearly illustrated how fire departments are divided equally for and against quints.

Loeb (1989c) concluded his “Quint Fever” articles by saying:

Our facts and figures show that the quints are out there, spread across the land fighting fire and being applied in a variety of different ways with their companion apparatus.

While I never had one in my old command, I can see where one would go well as matters stand today.



How matters stand today and tomorrow is the deciding factor as to whether or not the quint will subside in popularity-it could fall back into the pack to be just another component, or continue its rise in popularity and achieve overall prominence (p.36).

It appears today the quint has fallen back into the pack to be just another component of the fire service. It is this author's hope that the fall back is due to the quint not producing the desired outcomes for the community and not the fire service.

### **RECOMMENDATIONS**

After completion of this applied research project, this researcher feels the literature and the survey instrument provide only information to recommend a process for purchasing two aerial devices for the Grand Rapids Fire Department and not a recommendation on which type. This author recommends:

1. The Grand Rapids Fire Department establish a committee to make recommendations to the fire chief for purchasing two aerial devices.
2. The committee will include a needs assessment for the purchase process. This process should be modeled as described in the literature review. The process should focus on "needs" not "wants". The assessment must include outcomes of the purchase.
3. The committee will set the objectives for the new apparatus as well as evaluate the two current quints. Additional data should include:
  - a. Review station locations for present and future aerial devices.
  - b. Review current training for present quints –For officers and crews.
  - c. Review current standard operating procedures for the quints.

4. Develop tool to retrieve historical data since the purchase of the two quints in 1992.

This data should include:

- a. Average time per day the aerial devices are separated from engine (s).
  - b. Annual number of alarms the aerial devices arrives first on the fire scene.
  - c. Annual number of alarms the quints used pump, hoses, and water.
5. Develop tool to gather present and future trend data to enable the Grand Rapids Fire Department to predict future needs. Apparatus will be in service for 10-15 years. Data is critical for predicting if apparatus will fit those needs. This data should include:
    - a. Projected average time per day the aerial devices will be separated from engine (s).
    - b. Projected annual number of alarms the aerial devices will arrive first on the fire scene.
    - c. Projected annual number of alarms the quints will use pump, hoses, and water.
  6. Develop a “users” survey to be distributed to all assigned personnel to gather input.

The survey should be “outcomes” based also.
  7. Committee will utilize contacts from survey as a “networking” tool to gather additional information concerning the use of quints and traditional aerial ladder devices.

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**Applied Research Project Survey  
National Fire Academy  
Financial Management 2000**

*1. Department Size:*

- A. 0-100 ☐  
 B. 100-150 ☐  
 C. 150-200 ☐  
 D. Above ☐

*2. What is the population of the community you serve?*

- |                       |                          |                       |                          |
|-----------------------|--------------------------|-----------------------|--------------------------|
| A. 50,000 to 100,000  | <input type="checkbox"/> | D. 200,000 to 250,000 | <input type="checkbox"/> |
| B. 100,000 to 150,000 | <input type="checkbox"/> | E. 250,000 to 300,00  | <input type="checkbox"/> |
| C. 150,000 to 200,000 | <input type="checkbox"/> | F. 300,000 and above  | <input type="checkbox"/> |

*3. Which services below does your department provide to your community?*

- |                 |                          |                   |                          |
|-----------------|--------------------------|-------------------|--------------------------|
| A. Fire         | <input type="checkbox"/> | D. EMS            | <input type="checkbox"/> |
| B. Hazmat       | <input type="checkbox"/> | E. Confined space | <input type="checkbox"/> |
| C. Water rescue | <input type="checkbox"/> | F. Other          | _____                    |

*4. How many aerial devices (platform or straight ladder etc.) presently exist in your department?*

- |         |                          |          |                          |  |
|---------|--------------------------|----------|--------------------------|--|
| A. None | <input type="checkbox"/> | D. Three | <input type="checkbox"/> |  |
| B. One  | <input type="checkbox"/> | E. Four  | <input type="checkbox"/> |  |
| C. Two  | <input type="checkbox"/> | F. Five  | <input type="checkbox"/> | G. More <input type="checkbox"/> _____ |

*5. How many of your department's aerial devices are "quint" type?*

- |         |                          |          |                                |
|---------|--------------------------|----------|--------------------------------|
| A. None | <input type="checkbox"/> | D. Three | <input type="checkbox"/>       |
| B. One  | <input type="checkbox"/> | E. Four  | <input type="checkbox"/>       |
| C. Two  | <input type="checkbox"/> | F. More  | <input type="checkbox"/> _____ |

*6. Has your department purchased any new aerial devices in the last 5 years?*

- A. YES ☐  
 B. NO ☐

7. *If you have purchased an aerial device(s) in the last 5 years, how many have been “quint” type?*

- A. None ☐ D. Three ☐  
 B. One ☐ E. Four ☐  
 C. Two ☐ F. More ☐ G. Have not purchased any ☐

8. *Does your department plan to purchase any “quints” in the future?*

- A. YES ☐  
 B. NO ☐

9. *When writing specifications for an aerial device, please list the following in order of importance.*

- A. Compartment space ☐ D. Aerial ladder length ☐ Other \_\_\_\_\_  
 B. Ground ladder storage ☐ E. Needs of the Community ☐  
 C. Fire Pump ☐ F. Ease of Operation ☐

10. *Does ISO rating influence your decision when buying an aerial device?*

- A. YES ☐  
 B. NO ☐

If your time permits, I would appreciate any comments that would assist me in my research concerning your thoughts on the advantages and disadvantages of both “traditional” and “quint” aerial devices.

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Your department will not be identified by name in the research report. Please provide your department’s name and contact person if any follow-up questions are needed.

Department: \_\_\_\_\_ Contact person: \_\_\_\_\_  
 Telephone: \_\_\_\_\_ E-mail: \_\_\_\_\_